CLAIMS:

[C001] 1 A mask layer for a high-density near-field optical storage system, the mask layer comprising:

a nonlinear optical material; and

nanoparticles embedded in the nonlinear optical material of the mask layer.

[C002] 2. The mask layer of claim 1 wherein at least part of the nonlinear material comprises a material selected from the group consisting of phase change materials, photo-refractive materials, photo-chromatic materials, and combinations thereof.

[C003] 3. The mask layer of claim 2 wherein the nonlinear material comprises antimony.

[C004] 4. The mask layer of claim 2 wherein the nonlinear material comprises an organic material.

[C005] 5. The mask layer of claim 1 wherein the nanoparticles comprise metallic nanoparticles.

[C006] 6. The mask layer of claim 5 wherein the metallic nanoparticles comprise silver.

[C007] 7. The mask layer of claim 5 wherein the metallic nanoparticles comprise gold.

[C008] 8. The mask layer of claim 5 wherein the nanoparticles comprise rods or shell structures.

[C009] 9. The mask layer of claim 8 wherein the nanoparticles comprise rods having widths of about 20 nanometers and lengths of about 50 nanometers.

[C010] 10. The mask layer of claim 8 wherein the nanoparticles comprise vertically aligned nanoparticles.

[C011] 11. The mask layer of claim 5 wherein nanoparticles comprise coated nanoparticles.

[C012] 12. The mask layer of claim 11 wherein a coating of the coated nanoparticles comprises oligonucleotides functionalized on the 5' or 3' end with alkylthiol.

[C013] 13. An optical disk comprising:

a data layer;

a mask layer overlying the data layer and comprising a nonlinear optical material and nanoparticles embedded in the nonlinear optical material.

[C014] 14. The optical disk of claim 13 further comprising a spacer layer between the data and mask layers.

[C015] 15. The optical disk of claim 14 wherein the spacer layer comprises ZnS-SiO_2.

[C016] 16. The optical disk of claim 14 wherein the spacer layer comprises SiN.

[C017] 17. The optical disk of claim 14 further comprising a substrate situated on at least one outer surface of the optical disk.

[C018] 18. The optical disk of claim 13 wherein the data layer comprises $Ge_2Sb_2Te_5$.

[C019] 19. The optical disk of claim 13 wherein the data layer comprises a dye doped organic material.

[C020] 20. The optical disk of claim 13 wherein at least part of the nonlinear material comprises a material selected from the group consisting of phase change materials, photo-refractive materials, photo-chromatic materials, and combinations thereof.

[C021] 21. The optical disk of claim 20 wherein the nonlinear material comprises antimony.

[C022] 22. The optical disk of claim 20 wherein the nonlinear material comprises an organic material.

[C023] 23. The optical disk of claim 13 wherein the nanoparticles comprise metallic nanoparticles.

[C024] 24. The optical disk of claim 23 wherein the metallic nanoparticles comprise silver.

[C025] 25. The optical disk of claim 23 wherein the metallic nanoparticles comprise gold.

[C026] 26. The optical disk of claim 23 wherein the nanoparticles comprise rods or shell structures.

[C027] 27. The optical disk of claim 26 wherein the nanoparticles comprise rods having widths of about 20 nanometers and lengths of about 50 nanometers.

[C028] 28. The optical disk of claim 26 wherein the nanoparticles comprise vertically aligned nanoparticles.

[C029] 29. The optical disk of claim 23 wherein nanoparticles comprise coated nanoparticles.

[C030] 30. The optical disk of claim 29 wherein a coating of the coated nanoparticles comprises oligonucleotides functionalized on the 5' or 3' end with alkylthiol.

[C031] 31. A method of storing data comprising:

(a) providing an optical disk comprising a data layer and a mask layer overlaying the data layer and comprising a nonlinear optical material and nanoparticles embedded in the nonlinear optical material;

(b) using a gate beam to modify an index of refraction in a portion of the nonlinear optical material, the portion comprising a modified portion; and

(c) using a signal beam to provide nanoparticle resonance excitation of selected nanoparticles within the modified portion of the nonlinear optical material.

[C032] 32. The method of claim 31 wherein (a) comprises providing the optical disk with a spacer layer between the data and mask layers.

[C033] 33. The method of claim 31 wherein the gate beam has a wavelength ranging from about 500 to about 800 nanometers and the signal beam has a wavelength ranging from about 600 to about 800 nanometers.

[C034] 34. The method of claim 33 wherein the gate beam has a power ranging from about 5 to 10 milliwatts and the signal beam has a power ranging from about 10 to about 40 milliwatts.